

Review Article

AN OVERVIEW ON MEDICINAL PLANTS FOR THE TREATMENT OF ACNE

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ABSTRACT

Acne is the most common skin condition with substantial cutaneous and psychological disease burden characterized by different areas of scaly red skin, papules, blackheads and whiteheads, nodules and pimples. The pathogenesis and existing treatments for acne is difficult. The severity of acne varies greatly among the individuals and genetic background plays a vital role in its development. *Propionibacterium acnes* (*P. acnes*) have been recognized as pus-forming bacteria which triggers the inflammation in acne. The present study was conducted to evaluate antimicrobial activities of Indian medicinal plants against the etiologic agents of acne vulgaris. Pathogenic factors include increased sebum production, hyper cornification of pilosebaceous ducts, abnormal bacterial function, and production of inflammation. The therapy includes yearlong administration of synthetic medicines, which can cause severe side effects. Hence, the less toxic and safe substances are needed for the treatment. Herbal or herbal based medicines are safe alternatives in which extracts of natural origin are used as medicines. The aim of herbal therapy is to provide safe, efficient and economical medicines so that the people can utilize them. In present review input of herbs in the treatment of acne is summarized. Different databases were searched for retrieving all the medicinal plants with anti-acne activity.

Keywords: Antimicrobial activity, Acne, *Propionibacterium acnes*, Medicinal plants

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INTRODUCTION

Acne vulgaris, the widespread inflammatory skin disease affects 85% of the population throughout their lives. It is a type of skin disease which arises when there is a blockage of hair follicles with the departed skin cells. Although death rate associated with this skin disorder is less, it is a major health concern because of the psychological effects [1]. Acne affects both males as well as females at their puberty. Keratin formation takes place due to the testosterone stimulation from the cells lining the follicular canal and also due to sebaceous glands enlargement which leads to produce more sebum. Pimples are produced and the canals are blocked due to overproduction of sebum. Blocked canals will lead to overgrowth of bacteria which is responsible for acne. These bacteria release the enzymes which cause breakage of the sebum which stimulates inflammation [2]. The key factors in the formation of acne lesions are increase in sebum production, sloughing of keratinocytes, bacterial growth and inflammation [3]. The microorganism named, *Propionibacterium acnes* (*P. acnes*) has been recognized to be the main cause in acne vulgaris development. It is a Gram-positive, anaerobic bacterium which produces propionic acid as a metabolic by-product [1]. Therefore, the compounds targeting acne vulgaris should have ability to inhibit *P. acnes*. Antibiotics have been used to treat acne for so many years; however, the presence of antibiotic resistance strains has been increased as reported. Therefore, there's a challenge to discover new substances derived from nature to overcome this problem.

Types of acne vulgaris

Acne lesions are small patches formed and are an exterior form of comedones. Depending on whether the pore is open or not, these are generally referred as blackheads and whiteheads. Blackhead is defined as the pore where the opening is plugged by mixture of sebum with keratin resulting in the condition where at the surface it becomes blackened. Whiteheads are closed pores filled with the secretion of the sebaceous gland that swells beneath the tissue. If there is a pore opened it leads to the entry of different types of bacteria. Pustules are small swollen lesions on the skin that are filled with pus. Generally, pus is formed with the combination of leukocytes, bacteria and dead skin cells. Usually these are formed around hair follicles. Papule is defined as small, solid usually inflammatory lesion on the skin without any pus. Small papules can appear in clusters, due to the tissue's response to acne. Nodules are solid lesions which are very painful lesions caused by acne. These tend to extend into the deeper layers of the skin which leads to tissue damage. They leave the scars behind and very painful to remove. This condition is severe form of acne. Maculae is a red spot on the skin left behind by an acne lesion. These are flat in nature and group of maculae gives the face an inflamed feature. Cysts are lesions which are similar to capsules in shape and they contain semi-liquid or liquid pus comparable to that found in pustules. However, these are larger than pustules and are capable in getting infected. Similar to nodules these also extend deeper into the skin and leave a scar behind. Nodulocystic acne is probably the most terrible type of acne [4] (table 1).

Table 1: Causes of acne

Causes	Contribution
Infection	Microorganism like <i>P. acnes</i> is one of the causative agents for acne. They have ability to adapt the abnormal production of oil, inflammation and inadequate sloughing of acne pores.
Diet	Acne vulgaris is seen to be associated with foods which have high glycaemic index like milk, salt, chocolates etc. studies have shown the relation of obesity with acne.
Genetics	In some peoples, the cause of acne might be genetic rate of acne is seen among first degree relatives and in twin studies as well. The genes, which attributed to acne, are polymorphisms in IL-1 α , TNF- α and CYP1A1.
Hormonal changes	Puberty and menstrual cycles which cause hormonal changes and this contributes to acne vulgaris. Androgen is the sex hormone that increases during puberty and pregnancy; it may produce more sebum in follicular glands. Also anabolic steroids can lead to development of acne vulgaris in adult women.
Psychological causes	Several researchers have suggested the relationship between stress and acne severity. An increase in stress level can affect the acne flare.

Table 2: Classification and description of acne

Classification	Description
Mild (Grade I)	The mildest form of acne with symptoms of blackheads or whiteheads, milieus and minor pimples which has no inflammation and can be treated with over the counter products.
Moderate (Grade II)	This consists of more blackheads, whiteheads. Papules and pustules are frequently found. Grade II can also be treated with over the counter medications
Severe (Grade III)	This is moderate to severe acne with widespread papules and pustules. Grade III acne shows the characteristics like redness and inflammation.
Very severe (Grade IV)	This is also called as cystic acne. This is the most severe category of acne. The skin will show signs of numerous pustules, nodules, cysts, blackheads and whiteheads. The inflammation and breakouts tend to bodily areas in addition to the face.

Classification of acne

Acne vulgaris is one of the obsessed diseases in India. Acne vulgaris was graded by Indian tradition by means of a simple grading system, which classifies acne vulgaris into four grades given in table 1 [5, 6].

Pathogenesis of acne

There is no proper mechanism in acne but there are four different pathogenic factors responsible [7]. However, the possible mechanism of pathogenesis of acne suggested below (fig. 1):

Increased in sebum production

In the pathogenesis of acne, sebaceous glands play a vital role so the disease is also been called as sebaceous glands disorder [7, 8]. Pilosebaceous unit is the main base and it is a cell lined follicle with large sebaceous glands and a fine hair that rarely extends out of the follicle. The common acne-prone areas are cheek, nose, forehead, chin and also on the chest and back [9]. The skin consists of hair follicles with each connected to a sebaceous gland which produces an oily substance called "sebum". Increase in the sebum production is one of the important factors due to which acne lesions are formed [10]. Acne lesions are mainly correlated with the increase in serum levels of testosterone [11]. Peripheral conversion of testosterone to dihydrotestosterone explains why sebaceous glands enlarge at puberty [12]. One possible role of sebum in the pathogenesis of acne is comedogenesis [10]. Another certain role of sebum is providing the substrate for *P. acnes* growth [13].

Hyper cornification of the pilosebaceous ducts

Blocking of pilosebaceous duct takes place before the ingrowth of acne lesions. This blocking is provoked by building up of adherent keratinized cells within the pores, showing an effect and not letting the sebum to flow [14]. At puberty stage testosterone levels increase in both females and males which helps in the production of more sebum by inducing sebaceous gland. Hair follicle is lined up with Keratinocytes. With these keratinocytes along the sebum will block the hair follicle which is called as plugging and this is the first sign of acne. Because of this plugging the sebum can't reach the skin surface. Hyper proliferation of corneocytes is formed due to the deformities in sebaceous lipids [7]. Meanwhile shortage of linoleic acid may lead to comedones formation. This linoleic acid is incorporated into cells of sebaceous gland via plasma [3]. As the follicular cells play a key role in the obstruction of follicular lumen, hence sebum gets entangled beneath the hyperkeratotic plug and dilates the follicle; so normal follicular design is disrupted [5]. The end results in hyperkeratinisation is the development of comedones. In addition, follicular epithelium, sebum, bacteria and saprophytic yeasts encompass lesions of pilosebaceous ducts [6]. In the stage of premenstrual acne, alterations in the duct size vary in presence of fluid retention which leads to inflammation in keratin. Around 30% treated biopsy of non-inflamed lesions has shown the absence of bacteria [15]. Major fault is escalation of sebum production, which further provokes the formation of bacterial colonies and infection [7].

Microbial invasion

Microorganisms play an important role in acne. Acne-prone areas on surface of the skin are colonized with microorganisms *Propionibacterium* *acnes* and *Staphylococcus epidermidis*. Study based on inhibition suggests that *P. acnes* is the main organism [16, 17]. Hair follicles are packed with cells and oil. And the mixture of these cells and oil helps in

the production of *P. acnes* which grows in the plugged follicle. When *P. acnes* bacterium is formed in the blocked follicle, this will enhance the leukocytes to attack which results in skin inflammation. This bacterium is anaerobic and it promotes its growth in an ideal environment with decreased oxygen tension and obstructed lipid-rich lumen [9]. The overgrowth of *P. acnes* produces free fatty acids and this may lead to the formation of micro comedo [18].

Inflammation

With the lesions of acne the organization of *P. acnes* is a good stand out with control in the growth of *P. acnes* on using antibiotics. There is an improvement along with the decrease in acne lesions [9]. It's not that clear about why endogenous bacteria colonise follicles of sebaceous glands. Inoculation of refined polypeptide via keratinized follicular epithelium of sebaceous follicles are constantly attached and engaged to polymorph nuclear leukocytes to the follicular site [19]. Neutrophil ingests the intra-follicular *P. acnes* with periodic release of hydrolytic enzymes. This alteration allows the intra-follicular enzymes to rescue into the surrounding dermis and produce inflammation. Studies prove that neutrophilic hydrolytic enzymes, *P. acnes* enzymes, sebum and foreign bodies play a vital role in the formation of inflammation [8]. The combination of keratin, sebum and microorganisms especially *P. acnes* leads to the discharge of pro-inflammatory mediators and aggregation of lymphocytes, neutrophils and foreign body cells. Further this again originates the development of inflammatory pustules, nodulocystic lesions and papules. All these can be characterized by swelling, heat, redness and pus. By that time, the walls of the follicle break down which leads to spreading of the sebum, dead cells and bacteria to the surrounding dermis. Neurological disorders like mental depression have shown the promising effect on acne formation [20, 21].

Medical treatments using synthetic drugs

To treat acne, there are both topical and systemic treatments used. The patient's response to the treatment noticeably may vary from one to another. Usually, there is more than one treatment for acne and the good results are brought out when the treatments are individually classified on the basis of clinical evaluations. Retinoid are used for the people of who only have comedones and can reduce the number of comedones and inflammatory lesions. Others, including isotretinoin, antibiotics, topical antimicrobials, and hormonal therapy yield high response rates. Topical antibiotics with combination of retinoids are used in the patients with mild to moderate severity, i.e., inflammatory acne along with papules and pustules. Oral antibiotics are the first-line therapy for patients with moderate to severe inflammatory acne. However, oral isotretinoin is recommended for severe nodular acne and psychological distress. Isotretinoin is a teratogen, which needs strict precaution for use among women of the childbearing age [22, 23].

Essentiality of natural product

Natural products derived from plant, animal and mineral sources have the capacity to treat different human diseases. Around 80% of the general population uses natural products for the treatment of different diseases whereas allopathic drugs may cause many side effects. Acne causing bacteria becomes resistant to the drugs if they are used for a long period. Due to low toxicity and side effects, herbal medicine is becoming popular when compared to allopathic [24]. The natural system of medicine focus on the entire body and treat the root cause of acne, whereas allopathic medicine focus only

on treating the symptoms like inflammation, redness etc. associated with blemishes [25]. In the treatment of acne, herbal drugs are considered due to their negligible adverse effects. Herbal therapies gain the attention of cosmeticians, researchers, academicians, dermatologists and industrialists for acne treatment in upcoming years. Acne treatment with herbs is given by either externally or internally or with both. The most preferable choice of treatment is topical application of herbs because of the ease of application

whereas when they are taken internally they may cause bitter or unpleasant taste. Herbs are used in many cosmetic formulations and anti-acne compositions as they are safe with good efficacy. This review mainly focuses on the herbals extracts, powders and essential oils for topical treatment in case of Acne vulgaris. The purpose of this study is to set the trend for better medicinal use of herbs for acne treatment and to discover the active constituents responsible for ant acne activity [26].

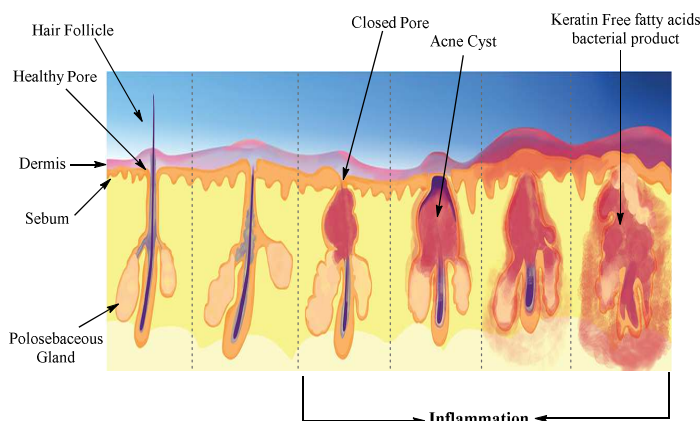


Fig. 1: Graphical representation of acne pathogenesis

***Azadirachta indica* Linn**

The bark, leaves, seeds and latex have been used for the treatment of many skin problems due to the presence of medicinal properties. The plants belong to India and Srilanka. The main chemical components are tri-terpenoids and tetra-nortriterpene in seed oil; nimbolin A and B, nimbin, gedunin, tannin and volatile oil in the barks and leaves. It is showed anti-inflammatory, antimicrobial and antibacterial properties [27, 28]. Research has shown that it is effective in curing acne. In a study conducted on anti-acne, the ethanolic extract of *Azadirachta indica* possessed anti-acne potential by inhibiting the growth of *P. acnes* [29].

Rosmarinus officinalis

It is an herbal remedy with verified health benefits like antioxidant, anti-inflammatory, anti-carcinogenic, anti-antimicrobial activity. Several studies have shown that either rosemary extract or its constituents inhibit TLR4-mediated inflammatory responses stimulated by lipopolysaccharide (LPS). Therefore, hypothesized that rosemary extract may inhibit *P. acnes*-induced inflammation through the modulation of TLR2-mediated signalling pathways [30-32]. Especially the rosemary essential oil is shown to be effective against *P. acnes*, the bacterium which is responsible for acne [33].

***Curcuma longa* Linn**

It is distributed widely throughout India, Asia. The main constituent in curcuma longa includes curcuminoids, essential oil with a high content of bisatiolane derivatives. Turmeric exhibits incredible activity of anti-inflammation which is recognized to curcumin [34, 35].

***Amaranthus hypochondriacus* Linn**

It is distributed throughout China and Mexico. Amaranthus seeds and leaves possess the astringent activity and are used as a face wash to the skin problems like eczema, psoriasis and acne. The chief component is saponin which plays key role for skin treatment [36].

***Betula alba* Linn**

It is mainly found in U. S, Canada and Europe. The bark of betula alba is basically used for treating acne, eczema, psoriasis along with other skin diseases [36]. The main constituents responsible are guaiaicol, betuloside, betulin, sakuranetin, terpenoids, salicylic acid and ylangene [37].

***Eucalyptus globules* Linn**

Is an important ethnomedicinal plant. The leaves extracts showed antimicrobial activities [38, 39]. Eucalyptus oil is used for wound healing and fungal infections in the form of topical ointment. The essential oil, which is taken from the leaves possesses antiseptic properties as well as astringent property to treat acne-prone skin [40].

***Santalum album* Linn**

It is used for inflammation and well-known for the volatile oil. This is widely used as antiseptic and also acts as a skin softener. It also helps in reducing itching and inflammation of skin. One of the most effective remedies is sandalwood powder paste for acne and acne scar removal and also helps in removing blemishes and act as good astringent for oily skin [41].

***Melaleuca alternifolia* Linn**

It is distributed widely in Australia and the tea tree essential oil is obtained by steam distillation which effectively fights with acne-causing bacteria. This oil is incorporated into many skincare products, personal care products, hair preparations and cosmetics [42]. Its topical anti-bacterial activity is due to terpenin-4-ol [43]. Tea tree oil has good penetration power and is non-irritating to skin.

***Ocimum sanctum* Linn**

Holy basil essential oil has shown good results when tested in trials as an anti-bacterial treatment. At low dilutions this essential oil has proved to show good antimicrobial activity [44-46]. The constituent named linolenic acid which is present in basil can block the cyclooxygenase and lipoxygenase pathways of arachidonate metabolism which could be responsible for the anti-inflammatory activity of the oil [47] and hence responsible for the anti-inflammation associated with acne.

***Simmondsia chinensis* Schneider**

Is a desert shrub native to Arizona, California and North Mexico. Oil obtained from jojoba seeds is 50% colourless and odourless which is being used in several cosmetics. The oil is composed of straight chain monoesters of C-20 and C-22 acids and alcohols and two double bonds [48-50] and helps in the treatment of acne and psoriasis [51].

***Thymus vulgaris* Linn**

It is native to Europe and Asia. Salves prepared from leaves have been used for the treatment of burns, cuts, acne and rashes [36]. The major constituents responsible for its activity are carvacrol, p-cymene, thymol acetate and apigenin [37].

***Juglans nigra* Linn**

It is native to South-East Europe, North and South America, East Asia. The *Juglans nigra* makes an excellent wash for skin infection like acne vulgaris [36]. Major constituents include ellagitannins, naphthalene derivatives juglone, flavonoids like hyperoside and quercetin [52].

***Soponaria officinalis* Linn**

It is a herbaceous plant native to Northern Europe. It is also called as Soapwort and it has been given topically for the treatment of acne, psoriasis, eczema and boils [53]. It contains steroidal saponins especially saponoside-D [54].

***Citrus aurantium* Linn**

This plant is indigenous to tropical Asia. The chief constituents are linalool, linalyl acetate, α -pinene, limonene, nerol, geraniol, methyl anthranilate, limonoids, and flavonoids [55]. The juice and the milk paste of the powdered peel had been reported for the treatment of acne [56].

***Rheum officinale* Baill**

Rhubarb is widely distributed in Southern Siberia, China and India. The major components include potassium, calcium and low amount of phosphorus. The anthraquinones present are rhein, emodin, and chrysophanol in this plant and is used to relieve the pain and reduce the itching property, which can lead to psoriasis as well as acne vulgaris [57].

***Pinus roxburghii* Sarg**

It is one of the largest and most essential of coniferous genera. Pines are distributed throughout the northern hemisphere. The main constituent is pycnogenol, which is responsible for the treatment of acne [36].

Serenoa repens

Is derived from the berries of the saw palm tree, which bears a fern-like appearance. It is native to Florida and America. The primary active compounds in saw palmetto are a combination of flavonoids, plant sterols and fatty acids, which acts as anti-acne, anti-inflammatory agent and immune system booster. It alters testosterone levels by inhibiting the conversion of testosterone into dihydrotestosterone or DHT [58-62].

***Pterocarpus santalinus* Linn**

It is mainly used as astringent and the tonic is used as a topical application for reducing inflammation [63]. The secondary metabolites of various chemical types present in plant species is known to possess antimicrobial property [64]. Flavonoids present in this are responsible for antimicrobial activity against various microorganisms [65].

***Plumbago zeylanica* Linn**

It is an herb that grows widely in India [66]. *Plumbago zeylanica* is enormously accepted for parasitic skin diseases [67, 68]. Plumbagin, the main chemical constituent is proved to show antimicrobial and antibiotic activity and is lethal to wide spectrum bacteria [69-71].

***Viola tricolor* Linn**

This herb is used for healing skin disorders like acne, eczema etc. It can be applied topically on the skin and it relieves the pain related along with acne [72, 73]. Main constituents present are flavonoids, glycosides gultherine, saponins, tannins, mucilage and salicylic compounds. All these show their effectiveness against many skin infections.

***Curcubito pepo* Linn**

It is an annual plant with yellow flowers, its seeds show antibacterial activity for the treatment of bacterial infections [74]. Linoleic, oleic,

palmitic and stearic acid are the constituents present and these are isolated from the seeds which show anti-inflammatory property [75, 76]. The roots infusion is used on herpes lesions, syphilitic sores, blackheads and acne [77].

***Cocos nucifera* Linn**

It has been possessing antimicrobial, antiviral anti-protozoal activity. It contains phytoharmones, sugars, fatty acids, vitamins, amino acids and minerals. Coconut oil acts as emollient in many skin infections and can be used on the skin with acne as it has antimicrobial property and the presence of vitamins-E, fatty acids which are converted into monolaurin and monocarbin, by the help of bacteria which is present in the skin and these, by destroying the harmful microbes along with bacteria, will protect the skin from acne [78].

***Carica papaya* Linn**

The fruit, peel, leaves and seeds of the papaya are rich in essential enzymes which give wonderful medicinal properties topically in the treatment of many skin conditions. Literature data have found that papaya have the capability to rejuvenate and repair the skin [79]. The papaya fruit contains the enzyme papain helps in exfoliation which means removing the dead cells and damaged skin [80]. The raw papaya juice is used in the prevention of pus formation and also treats swollen acne [81].

***Hemamelis virginiana* Linn**

This plant is known for its medicinal and healing properties and is widely distributed in North America. It is mainly used for sores, swelling and bruises. The main constituents present in *Hemamelis virginiana* are tannins, gallic acid, catechins, proanthocyanins, flavonoids, essential oil, choline, saponins and bitters [82]. It is used to remove impurities and dirt from the surface of the skin because of the astringent property. It also helps to unclog the skin pores which are blocked hence used in acne treatment [83].

***Kaempferia galanga* Linn**

It is used as spice ingredients and medicinal herbs and is valued traditionally for wound healing property [84]. Extract prepared by proprietary extraction [85] has shown good inhibitory activity when compared to conventional extract against *Propionibacterium acnes*. The resulting extract has found to be of composition which has antimicrobial action suggesting its benefit in acne treatment [85].

***Berberis aquifolium* Pursh**

It is native to North America [86]. The root and bark is used as diuretic, laxative and tonic [87, 88]. However, recent studies have found that *Berberis aquifolium* is used to decrease sebum; reduce the infection and inflammation. On topical application, this plant is used in the reduction of sebum and it also kills bacteria which is present on skin surface. It is generally used in gel and cream formulations in the acne treatment [89].

***Taraxacum officinale* Linn**

It is common in much modern and traditional herbal medical system and widely distributed throughout Asia, Europe and North America. Common vital constituents in dandelion are sesquiterpene lactones which are show anti-inflammatory activity. Major sesquiterpene lactones, generally occurring as glycosides, include taraxacosides, taraxacolides, dihydrolactucin, taraxinic acids and ainslioside [90]. Its roots have a long history for its use in dermatological disorders such as spots, pimples and acne [91-94].

***Cinnamomum camphora* Linn**

It is an aromatic plant which is well-known for its fragrance. The aromatic oils of cinnamomum are obtained mainly by the leaves as well as barks. These essential oils are reported to act as antifungal and antibacterial activity [95, 96]. A phytochemical study has been discovered that there are large amount of aromatic compounds like flavonols, alkaloids, lignins, phenyl propanoids, terpenoids and proanthocyanadins [97, 98]. As it gives the cooling effect to the skin, it

reduces the inflammation. The major benefits of cinnamomum are observed on oily skin. Hence, it is used in the treatment of acne [99].

Glycyrrhiza glabra Linn

It is commonly known as *Mulethi*. Traditionally its roots and rhizomes were used all over the world for the treatment of various

ailments. Liquorice roots are particularly rich in flavonoids [100]. Root of *Meluthi* contains 5-10% glycyrrhizin, licochalcone, glabridin, glbrene and studies shown that it possess antimicrobial activity [101]. Liquorice is one of the anti-inflammatory agents [102]. It is mainly used for skin irritations, acne and sunburns treatment [103].

Table 3: Some medicinal plants used in the acne treatment

Medicinal plant	Botanical name	Constituents	Properties and description
Neem	<i>Azadirachta indica</i> Linn	Tri-terpenoids and tetra-nortriterpene in seed oil; nimbolin A and B, nimbin, gedunin, tannin and volatile oil in the barks and leaves.	[27-29].
Rosemary	<i>Rosmarinus officinalis</i>	Essential oils	[30-33]
Turmeric	<i>Curcuma longa</i> Linn	Curcuminoids, essential oil, bisatiolane	[34, 35]
Amaranthus	<i>Amaranthus hypochondriacus</i> Linn	Saponin	[36, 48].
Silver birch	<i>Betula alba</i> Linn	Guaiacol, betuloside, betulin, sakuranetin, terpenoids, salicylic acid and ylangene	[36,37].
Eucalyptus	<i>Eucalyptus globules</i> Linn	Essential oils	[38-40].
Sandalwood	<i>Santalum album</i> Linn.	Volatile oil	[41]
Narrow leaved paperbark	<i>Melaleuca alternifolia</i> Linn.	Essential oil	[42,43, 60-62]
Holy basil	<i>Ocimum sanctum</i> Linn.	Essential oil	[44-47]
Jojoba	<i>Simmondsia chinensis</i> Schneider	Essential oil	[49-51]
Thyme	<i>Thymus vulgaris</i> Linn.	Carvacrol, p-cymene, thymol acetate and apigenin.	[36, 37]
Eastern balck walnut	<i>Juglans nigra</i> Linn	Ellagitannins, naphthalene derivatives juglone, flavonoids like hyperoside and quercetin.	[52].
Soapwort	<i>Soponaria officinalis</i> Linn.	Steroidal saponins-saponoside-D.	[53,54]
Orange	<i>Citrus aurantium</i> Linn.	Linalool, linalyl acetate, α -pinene, limonene, netrol, geraniol, methyl anthranilate, limonoids, flavonoids.	[55,56]
Rhubarb	<i>Rheum officinalis</i> Baill.	Potassium, calcium and phosphorus. Anthraquinones: rhein, emodin, chrysophanol.	[57]
Pine	<i>Pinus roxburghii</i> Sarg	Pycnogenol	[36]
Saw palmetto	<i>Serenoa repens</i>	Flavonoids, plant sterols and fatty acids.	[58-59]
Red sandalwood	<i>Pterocarpus santalinus</i> Linn.	Flavanoids	[63-65].
Ceylon leadwort	It is an herb that grows widely in India [66] with a biological name <i>Plumbago zeylanica</i> Linn.	Plumbagin	[67-71].
Wild pansy	<i>Viola tricolor</i> Linn	Flavonoids, glycosides gultherine, saponins, tannins, mucilage and salicylic compounds.	[72,73]
Cucumber	<i>Curcubito pepo</i> Linn	Linoleic, oleic, palmitic and stearic acid obtained from seeds.	[74-77].
Coconut	<i>Cocos nucifera</i> Linn	Phytohormones, sugars, fatty acids, vitamins, amino acids and minerals.	[78]
Papaya	<i>Carica papaya</i> Linn	The fruit, peel, leaves and seeds contain essential enzymes.	[79-81].
American witch-hazel	<i>Hemamelis virginiana</i> Linn	Hemamelis virginiana are tannins, gallic acid, catechins, proanthocyanins, flavonoids, essential oil, choline, saponins and bitters.	[82,83].
Aromatic ginger	<i>Kaempferia galangal</i> Linn	Rhizomes of <i>Kaempferia galangal</i> contain cineol, borneol, 3-carene, camphene, kaempferol, kaempferide, cinnamaldehyde, p-methoxycinnamic acid, ethyl cinnamate and ethyl p-methoxycinnamate.	[84,85]
Oregon grape	<i>Berberis aquifolium</i> Pursh [86].	Berberine-yellow alkaloid Berbamine and oxyacanthine-white alkaloids Phytosterin, gum and sugars.	[87-89]
Dandelion	<i>Taraxacum officinale</i> Linn	Sesquiterpene lactones occurring as glycosides include taraxacosides, taraxacolides, dihydrolactucin, taraxinic acids and ainslioside	[90-94]
Camphor tree	<i>Cinnamomum camphora</i> Linn	Aromatic oils, aromatic compounds like flavonols, alkaloids, lignans, phenyl propanoids, terpenoids and pro-anthocyanadins	[95-99].
Mulethi	<i>Glycyrrhiza glabra</i> Linn	Licorice roots contain flavanoids, 5-10% glycyrrhizin, licochalcone, glabridin, glbrene.	[100-104].
Bog Labrador tea	<i>Ledum groenlandicum oedar</i>	Tannic acid, arbutin, resin, mineral salts, volatile oils such as ledol and plaustrol.	[105]
Castor	<i>Ricinus communis</i> Linn	50% fixed oil-castor oil	[105]
Mountain arnica (Mountain tobacco)	<i>Arnica montana</i> Linn	Sesquiterpene lactones, helanalin, 11 α , 13-dihydrohelanalin, chamissonolid and their ester derivatives.	[106].
Black pepper	<i>Pipper nigrum</i> Linn	Essential oil are sesquiterpenes betacaryophelene and alpha-humulene.	[107]

Ledum groenlandicum oedar

Is native to North America and Canada. Leaves are used for medicinal properties. The main constituents include tannic acid,

arbutin, resin, mineral salts, volatile oils includes ledol and plaustrol. The leaves have been used as an astringent and a stronger decoction is used for itching and redness from skin ailments including acne [104].

***Ricinus communis* Linn**

It is commonly known as Castor, and the seeds of castor contain 50% of the fixed oil. Traditionally, it was used in reducing the inflammation and also toxins. Castor oil is used in many cosmetic, pharmaceutical products and also in personal care products. Ricinoleic acid and its derivatives which are present in castor have the quality of skin smoothing and moisturizing. It also involved in the treatment of acne [105].

***Arnica montana* Linn**

It is a common herb used in many gel and cream formulations for topical treatment to reduce inflammation and also to heal wounds. The major constituents contains sesquiterpene lactones, helanalin, 11 α , 13-dihydrohelanalin, chamissonolid and their ester derivatives. All these constituents help in reducing the inflammation and hence, it is used in acne treatment and also reduces bruises [106].

***Piper nigrum* Linn**

It commonly has known as *black pepper*. Oil obtained from it possess antibacterial properties [107]. Various studies had revealed that the essential oil is showing its effectiveness against *P. acnes*. And the main constituents responsible in this essential oil are sesquiterpenes betacaryophellene and alpha-humulene. Therefore it is used in acne treatment.

CONCLUSION

Acne vulgaris is one of the common skin problems affecting many people's lives. In consideration of several key aspects for the therapy of acne, an integrated therapeutic approach is required to achieve the preferred reports. Many clinical researches have proven that our traditional herbs have shown very promising effects in treating the acne. Although there are many medicines to choose from, plants are the natural source of medicines, which play an important role in the treatment of acne, without or slight side effects. Hence, they can be commonly used as alternatives to synthetic medicine for acne. A broad approach combining multiple herbs as well as lifestyle and dietary changes has helped with acne in preliminary clinical trials. Need of this review about using plants/plant extracts in acne treatment is to improve continuous research by using new technologies. It's probable that this will help the cosmetician, researchers, academicians, dermatologist and pharmacist to use all the multiple herbs more precisely for dermal topical formulation which results in maximum benefits of natural substances to the consumers. An overall, herbal medicine has much to improve the ability to deal with the complex issues with acne.

AUTHORS CONTRIBUTIONS

All the author have contributed equally

CONFLICT OF INTERESTS

Author(s) have no conflict of interest

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